

**Psychological changes and the resolution of acute neck pain after a motor vehicle
accident**

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Abstract

This study examines the changes in self-perception during resolution of an acutely painful neck injury sustained in a motor vehicle accident. We tested predictions from self-discrepancy theory and a model of self-pain enmeshment. Measures of discrepancy between the current (actual) self and both the ideal and feared-for self were predicted to remain stable over a 21-day recovery period whereas a measure of enmeshment was predicted to decrease as pain resolved. We also examined the relationship between daily ratings of achievement in several domains and participants perceived ideal performance. 60 patients with possible acute neck injury recruited within one month after a motor vehicle accident gave consent and data were obtained from 42 participants. Standard questionnaire measures of pain, disability, fear of movement, pain catastrophizing and self-discrepancies, self-pain enmeshment and data from diaries (measures of pain, mood, self-discrepancies, pain catastrophizing and fear of movement) were obtained.

In general the relationships between the measures of self-discrepancy and enmeshment and mood were in accord with both theoretical predictions and previous observations. Resolution of pain was associated with a reduction in enmeshment but not to change in self-discrepancy. Multilevel analyses of the diary data showed that concordance between actual and ideal performance increased over the 21 days of data collection. These data provide preliminary support for aspects of self discrepancy theory and the self-pain enmeshment model.

1. Introduction

A person's cognitive elaboration of their self has motivational consequences. Perceived discrepancies between the present and future self are associated with emotional states and act as a guide for the individual to engage in behaviour to moderate the magnitude of the discrepancy. Self discrepancy theory (SDT) (Higgins, 1987; 1997) explicitly details the emotional consequences of discrepancies between the actual (current self) and two future selves; the ideal (dejection) and ought selves (agitation). Other theorists (Carver et al., 1999) have proposed the presence of an undesired self, the feared self, which individuals strive to avoid i.e. increase the discrepancy between it and the current self. These theories relating self structure to behavioural and emotional function have been proposed without regard to the presence of adverse events, so what happens to a person's construction of their self in the presence of persistent pain? There is preliminary evidence that the expected associations between discrepancy and emotional state remain intact despite the presence of chronic pain (Waters et al., 2004).

Pincus and Morley (2001), however, proposed that one consequence of chronic pain was the enmeshment of an individual's representation of their self with their representation of pain. In addition to any emotional consequences, the rudimentary self-pain enmeshment model predicted that the extent of enmeshment contributed to distress, particularly depression. Morley and colleagues (Morley et al., 2005; Sutherland and Morley, 2008) tested the predictions using methods from SDT and related work on possible selves (Markus and Nurius, 1986). Chronic pain patients made judgments about whether their hoped-for self (analogous to the ideal self) was dependent on the absence of pain (being *un*-enmeshed). Support was found for the predicted function of enmeshment independent of any contribution of self discrepancies. These studies used a cross-sectional design and the causal relationship between enmeshment and distress could not be established. It may be ethically and practically

difficult to manipulate enmeshment experimentally but evidence for a causal relationship can be inferred from studying recovery from a pain episode. In the present study we used recovery from an acute episode of possible neck pain associated with a motor vehicle accident to test the self-pain enmeshment model. We asked three questions: 1) was there evidence of self-pain enmeshment in acute pain?; 2) was it associated with distress?; 3) if enmeshment was present did it resolve as pain diminished and individuals re-engaged in daily activities? While we expected enmeshment to decrease as pain diminished we considered that discrepancies between various aspects of the self would not be dependent on fluctuations in pain. SDT proposes that discrepancies act as behavioural guide for the developing self and we assumed that volatility in the various self aspects would be a poor basis for a behavioural guide. Thus discrepancies should remain relatively stable. We also examined the potential role of the undesired feared-for self. Morley and Eccleston (2004) have suggested that pain patients may have an elaborated feared-for self as the experience of pain raises many unwanted prospects e.g. disability, loss of autonomy, and social isolation. Details of specific hypotheses are given in the analysis.

2. Method

2.1 Design

A single cohort of participants who were involved in a car accident completed a set of standardized questionnaires that included measures of pain, depression, fear of movement and pain catastrophizing. They also completed a questionnaire assessing self-discrepancy and pain-self enmeshment. They then completed daily diaries for 21 days recording details of pain, mood, and concordance between their current and ideal behavioural activity, pain catastrophizing and fear of movement. The measures of self-discrepancy and pain-self enmeshment were re-administered at the end of the 21 days of diary keeping. A previous publication on this cohort (Vangronsveld et al., 2008) reports an analysis of data relating to the fear-avoidance hypothesis (Leeuw et al., 2007). We report only measures that are relevant to the current hypotheses.

2.2 Participants

The emergency care units of five hospitals and the traffic police of Limburg Zuid (the Netherlands) referred potential participants. Inclusion criteria were: involvement in a car accident no longer than 4 weeks prior to baseline assessment and aged 18 to 65 years. There were five exclusion criteria: presence of a head injury; unconsciousness after the accident; fracture or dislocation of the spine; pregnancy, and; not speaking Dutch fluently. The referral procedure and the included sample has been previously reported in Vangronsveld et al. (2008). However, there are some differences with the current sample due to the selection of different data for the purpose of this study. Sixty people gave informed consent. In contrast to the previous sample, data from 2 additional participants were immediately excluded because of too much missing data in diaries relevant for this study or not completing the self-

discrepancy questionnaires, and 3 participants were excluded because they experienced no pain at all, giving a total of 18 participants that were not included in the analysis. A further 8 participants gave incomplete data for the diaries, meaning that they did not complete all 21 diaries or follow-up questionnaires at day 21. Reasons for not completing the study were: lack of time (2); forgot to complete (1); moved or could not be contacted anymore (4); and ‘feeling like discontinuing’ (1). These participants were still included in the multilevel analysis.

2.3. Measures

2.3.1. Standardized questionnaires

2.3.1.1 Disability: The Dutch version of the Neck Disability Index (NDI) consists of 10 items concerning limitations in functional activities and symptoms. The 10 items are scored 0 (no limitations/symptoms) to 5 (severe limitations/symptoms) and summed to yield a total score (0-50). The NDI is a valid and reliable instrument, sensitive to measure changes within a population of neck pain patients (Vernon, 1997; Swinkels-Meewisse et al., 2003).

2.3.1.2. Pain. Pain was assessed using an 11-point Likert scale anchored with two labels “no pain at all” on the left side and with “worst pain ever” on the right side. Patients rated their pain for four components of their pain experience: (1) current pain, (2) worst pain since the accident, (3) least pain since the accident, and (4) average pain since the accident.

2.3.1.3. Pain Catastrophizing. Participants completed the Dutch version of the Pain Catastrophizing Scale (PCS: Sullivan et al., 1995). Respondents were asked to reflect on past painful experiences and to indicate the degree to which they experienced each of the 13 thoughts or feelings during pain on a five-point scale from 0 (not at all) to 4 (all the time). The Dutch version of the PCS has been shown to be valid and reliable (Van Damme et al., 2002).

2.3.1.4. *Fear of movement/(re)injury.* The Dutch version of the Tampa Scale for Kinesiophobia (TSK: Miller et al., 1991) was used to measure fear of movement / (re)injury. The 17 items are scored on a four-point scale from “I strongly disagree” (1) to “I strongly agree” (4). The scale has a good internal consistency and a good test – retest reliability (Swinkels-Meewisse et al., 2003; Roelofs et al., 2004a).

2.3.1.5. *Depression.* The Centre for Epidemiological Studies Depression Scale (CES-D: Radloff, 1977) consists of 20 items to measure different dimensions of depression. Questions are rated on a four-point scale (0-3). The Dutch version of the CES-D has a good internal consistency and a very good sensitivity and specificity (Beekman et al., 1994).

2.3.2. *Self Questionnaire: Self-discrepancies and self-pain enmeshment.* The Self Questionnaire was administered on day 1, prior to the start of the period of diary keeping, and on day 21 at the end of diary keeping.

We developed a checklist measure to assess self-discrepancies and self-pain enmeshment that could be administered within a reasonable period of time. We chose this method over the semi-structured interviews that have been more frequently employed in order to make the assessment less time-consuming and less abstract for the participants. The checklist comprised 38 adjectives, selected from previous studies on self-discrepancies. 24 adjectives were positive e.g. friendly, enthusiastic, and 14 were negative e.g. pessimistic, aggressive. A full set of adjectives is given in the Appendix. The complete set of adjectives was presented on five occasions (i - v). The list for each occasion was fixed but the order of presentation within each list was randomised. (i) On the first presentation of the list the participant was asked to endorse 10 to 15 items that best described their current self (actual-self). We constrained the number of choices as an attempt to control acquiescence response bias. (ii) They were then instructed to endorse 10 to 15 items to reflect how they would ideally like to be (ideal-self), and this was followed by; (iii) an instruction to endorse 10 to 15

items representing what they feared they might become (feared-self). The responses to these three presentations were used to assess actual-ideal and actual-feared discrepancies.

We adapted the method used by Morley et al (Morley et al., 2005) to assess self-pain enmeshment. In this method enmeshment was operationalised as the extent to which the participant believed that they could realise the nominated self aspect in the presence of pain. Essentially this method asks participants to make a judgment as to whether it is possible to be the sort of person they hope to be if pain is present. Inability to realise all of the nominated aspects of the self in the presence of pain represents complete enmeshment. The lists were presented on two further occasions: (iv) participants were asked to read this list and endorse the item if they thought that they could possess the attribute described by the item while experiencing pain, and; (v) they then re-read the list and judged whether they could possess the attribute if they did *not* have pain.

2.3.2.1. Psychometric qualities of the measures. We considered several possible methods of obtaining a reliability estimate for the actual, ideal and feared-for checklists. Computing internal consistency is problematic because we cannot regard the items within the checklist as parallel in the psychometric sense. This assumption is necessary in order to be able to compute Cronbach's *alpha* coefficient or the more appropriate Kuder-Richardson estimate for dichotomously scored items. Similarly we considered the test-retest coefficient is probably inappropriate primarily because a person could achieve the same total score on two occasions but endorse different subsets of items. We also consider that the occurrence of change vs. stability is one of the hypotheses of the study. However we elected to compromise in this respect and have computed an agreement coefficient for individual item endorsement across the two occasions of measurement at the beginning and end of the study; a period of 3 weeks. This solution circumvents the first problem with the standard test-retest coefficient but does not deal with the problem of stability over the 3-week time period of the study. We computed

Kappa and percentage agreement after pooling participants and items. The values of Kappa and its standard error (se) and the simple percentage agreement coefficient (%Agree) for each self aspect were: Actual self %Agree = 77.9, K = 0.50, se = 0.025; Ideal self %Agree = 80.2%, K = 0.55, se=0.025; Feared self %Agree = 82.3%, K = 0.51, se=0.028. The coefficients for the enmeshment judgments were: With pain %Agree = 74.2%, K = 0.47 se = 0.017; Without pain %Agree = 87.6%; K = 0.79 se=0.018.

2.3.3. *Diary*

A paper daily diary was used to monitor changes in pain experience, mood, disability and beliefs over a period of consecutive 21 days. *Current pain intensity* and *average pain* during the day were assessed by means of an 11-point Likert Scale. *Disability* was measured daily using all the items from the Neck Disability Index (NDI), except current pain, since it was already assessed by a previous question. All items were transferred to a 7-point Likert scale. The six items measuring functional limitations were anchored with ‘0’ meaning ‘not being able to perform this activity at all’ and ‘6’ meaning “being able to perform this activity very well’. Two items assessing complaints (headache and concentration problems) were anchored with “0” meaning ‘no complaints at all today’ and “6” meaning ‘experienced severe complaints today’. The two items measuring complaints were first recoded. Two items reflecting *fear of movement* were derived from the Tampa Scale of Kinesiophobia (TSK: Miller et al., 1991). The item “Today, moving was harmful for my body,” reflected the Harm subscale. The item “Today, I avoided activities that caused me pain,” reflected the Avoidance subscale. To measure *Pain Catastrophizing*, three items were derived from the Pain Catastrophizing Scale (PCS). Each item reflected one subscale. The item “Today, I kept thinking how much it hurts” represented the rumination subscale. The item “Today, I became afraid that the pain may get worse” represented the magnification subscale, and “Today, I felt as if the pain overwhelmed me” represented the helplessness subscale. All items were rated

on a 7-point Likert scale labelled 'not at all' (0) to 'very much' (6). *Mood* was assessed by 10 items rated on a 7-point Likert Scale on which participants had to indicate which feelings they had experienced during the day. There were 4 positive mood items (happy, relaxed, satisfied and delighted), and 6 negative mood items (irritated, depressed/sombre, sad, anxious, tired, frustrated).

The diary also included a measure of concordance between an individuals' perceived actual daily behavioural performance and their ideal performance. This was measured in 5 domains: (1) physical health, (2) mental health, (3) situation at work, (4) situation at home, and (5) activity level. Participants indicated on 7-point Likert scales how much they perceived their actual performance to be in concordance with their ideal.

For practical reasons and because of the explorative nature of these diary items, the actual-feared discrepancy and self-pain enmeshment were not measured in the diary. All items, except for the actual-ideal concordance items have been used in a previous diary study (Roelofs et al., 2004b). Seventeen additional questions were also included in the diary. However, since these data are not considered below, a detailed presentation of these questions is omitted.

2.4. Procedure

The Medical Ethical Committee of the University Hospital Maastricht approved the study. Potential participants were contacted by the researcher who informed them about the study and asked for their participation. If they agreed to participate they were then scheduled for an appointment in their home within a month after the accident. Verbal and written information about the study were given and all participants gave signed informed consent. The research assistant demonstrated how the diaries and the questionnaires were to be completed and how the participants could return all diaries and questionnaires by means of

pre-stamped envelopes. The participants were asked to return a set of 7 diaries each week, and the baseline questionnaires in week one by using the envelopes. Patients who completed all questionnaires and diaries received a gift certificate. All patients gave informed consent and were free to withdraw from the study at any time.

2.5. Data reduction and statistical analyses

Descriptive analyses and inferential tests were conducted with the Statistical Package for the Social Sciences (SPSS) version 13.0. The diary data were analysed with multilevel regression analyses. In multi-level modelling, the repeated observations (daily diaries) were level 1 units. These observations are organized within level 2 units. In this study level 2 represents the individual. This implies that there is one between-subjects level (participants) and one within-subject level (day). The significance of variances was determined by the likelihood ratio test. Beta (β) values were standardized for presentation. Since drop-out occurred on various time points, the N can vary according to the analysis or questionnaires. We therefore report the N where necessary in the tables or analyses.

We computed scores for the following variables:

2.5.1. Self-discrepancy. From the Self Questionnaire we calculated two self-discrepancy measures: the actual-ideal discrepancy, and the actual-feared discrepancy. The discrepancies were computed as the ratio of numbers of attributes uniquely endorsed i.e. attributes endorsed in only one of the pair of lists, to the sum of the number of unique and shared attributes endorsed. The latter (denominator) therefore ipsatized the discrepancy by ensuring that only those attributes deemed relevant to each individual were considered in the discrepancy score. The ratio nature of the discrepancy scores ensures that the value lies between 0 and 1. For the actual-ideal discrepancy a score of 0 represents no discrepancy while 1 represents maximum discrepancy i.e. there are no attributes shared between the actual and ideal selves. For the

actual- feared discrepancy a score of 0 represents no discrepancy i.e. a complete overlap of the actual and feared selves, while a score of 1 represents maximum separation of the actual and feared self. According to self-discrepancy theory for the actual-ideal self (AI-discrepancy) a low proportion is preferred (denoting that the individual's actual self is relatively near the ideal self). In contrast, for the actual-feared self (AF-discrepancy) a high proportion is preferred (indicating that the actual self is some distance from the feared self). Difference scores were calculated between day 1 and day 21 to investigate change in discrepancies.

2.5.2. Self-pain enmeshment. To compute the magnitude of self-pain enmeshment we used all the 38 adjectives as the denominator since participants had to respond to all adjectives with either yes or no in the two lists. For the numerator we summed up all adjectives that were exclusively endorsed with “yes” in the two lists i.e. an adjective endorsed with yes in both lists was not included. This reflects the difference in a participant's conception between who they can be with and without the presence of pain, since endorsing the same adjective with “yes” in both lists means that there is no difference. The result of the division is a proportion score: the higher the proportion, the greater self-pain enmeshment, indicating that this person endorsed many different adjectives for each list. To investigate whether there were time trends in self-pain enmeshment, we calculated difference scores between day 1 and day 21.

2.5.3. Diary data. We computed the participant's perception of the concordance between their actual and ideal performance for the 5 domains as an aggregated score: The higher the score, the greater perceived concordance between a participant's actual and ideal performance in the 5 domains. We use the term concordance to distinguish it from discrepancy as defined by Higgins (Higgins, 1987) and used in referring to self discrepancies in this article.

Whereas self discrepancies refer to self characterisation at the trait level of descriptors e.g.

creative, dependable, the current daily measure self characterisation is defined by reference to a participant's perceived performance in 5 domains of activity e.g. physical health. With regard to disability a composite score was computed by summing 9 of the NDI items and then reversing the score, so that a high score on this composite measure reflects high disability levels. The current pain item was excluded from the averaging process as we wished to examine the separate contribution of pain in subsequent analyses. For fear of movement and pain catastrophizing composite scores were computed by adding up the scores of the two items for fear of movement and three items of pain catastrophizing respectively. For pain we only used the item that measured current pain. For mood, items were summed up for two subscales, being positive mood (4 items) and negative mood (6 items).

3. Results

The analytic strategy we employed is reflected in the sequence of the results. Following a description of the sample we report correlations between the main questionnaire measures collected on day 1. The primary purpose of this analysis was to establish the validity of the measures in the present sample. We then report the associations between the standard questionnaire measures and the measures of self-discrepancy and self-pain enmeshment. SDT and the enmeshment model predict positive correlations between depression and the actual-ideal discrepancy and self-pain enmeshment measures. The relationship between the actual-fear discrepancy measure and disability has not been well documented but we conjectured that higher levels of current disability might plausibly be related to the actual-feared for discrepancy being reduced (shown by a negative correlation). The fourth set of analyses explored change in the standard measures and the self measures from day 1 to day 21. We expected that overall the sample would experience a reduction in their symptoms (pain, disability) and corresponding reduction in their perceived enmeshment. In contrast we predicted that the mean self discrepancies would not change significantly. Finally we explored the changes in daily assessments of perceived actual-ideal performance and their relationship to pain reports, the perception of disability and the cognitive appraisals of fear and catastrophizing. By analogy in the fourth set of analyses we expected to see a reduction in symptoms. As pain diminishes it should be easier to achieve performance goals and we expected a negative correlation between measures of pain and disability and the concordance measure.

3.1. Sample description

The final sample of 42 participants (24 women) completed the initial assessments. The mean age of the sample was 36 years ($SD = 13.70$). Compared to the participants who

dropped-out at the beginning of the data collection period ($n = 18$, 50 % men) with a mean age 46 ($SD = 11.51$), the participants in the analyses were significantly younger ($t = 2.82$, $P = 0.007$), but they did not differ on gender ($\chi^2 = 1.12$, $P = 0.382$).

At the start of the diary collection period, current pain on the 0-10 point Likert scale was 5.18 ($SD = 1.99$). The mean disability score on the NDI at baseline was 15.08 ($SD = 8.93$), indicating that subjects on average were mildly disabled. The mean Pain Catastrophizing score was 16.7 (11.2) which is in the same range as people without pain (Van Damme et al., 2002). The mean Fear of Movement score was 36.29 ($SD = 5.68$) which is comparable to a general population sample (Houben et al., 2005) and the mean depression score (CES-D) was 13.94 ($SD = 9.03$). Although this average score indicates that this sample was not clinically depressed up to 40 % of the patients reported a score higher than the traditional cut-off score of 16, indicating that some of these patient might have a depressive disorder (Beekman et al., 1994).

3.2. Associations between questionnaire measures

Table 1 shows the relevant correlations. As expected measures of depression, catastrophizing, fear of movement / (re)injury and pain were all inter-correlated in the expected directions and given the relatively small sample and the resultant wide confidence intervals (e.g. for $N = 42$ and $r = .43$ the 95%CI 0.15 to 0.65). The observed values fall within the ranges observed in more chronic populations but not all correlations were significant, notably those relating to the TSK.

3.3. Associations between standard measures, self-discrepancy and enmeshment

We tested the expected associations between the actual-ideal self-discrepancy measure and depression and the self-pain enmeshment measure and depression. Self-discrepancy theory predicts that greater actual-ideal discrepancy is significantly associated with a greater

experience of emotions of dejection, operationalized as depression in this study and previous studies of self-pain enmeshment indicate that higher levels of enmeshment are associated with higher levels of depression. The observed correlations were in the expected direction and significant: $r = 0.44$ (95%CI = 0.16 to 0.66) and $r = 0.51$ (95%CI = 0.24 to 0.70). Previous studies (Morley et al., 2005; Sutherland and Morley, 2008) have observed a correlation between the hoped-for self (which has been shown to overlap with the ideal self) and a measure of self-pain enmeshment. These two measures were significantly correlated in the present study ($r = 0.51$, 95%CI = 0.24 to 0.70). In agreement with our conjecture participants with a feared-for self closer to their actual self reported greater disability ($r = -0.43$ (95%CI = 0.15 to 0.65) and there was a marginally non-significant trend towards reporting higher levels of pain ($r = -0.32$ (95%CI = -0.02 to 0.59). However, actual-feared discrepancies were not significantly related to depression and catastrophizing. Finally, higher levels of self-pain enmeshment were associated with greater catastrophizing, $r = 0.42$ (95%CI = 0.13 to 0.64).

3.4. *Recovery (day1 to day 21 differences)*

Table 2 displays the mean scores for the self-discrepancy and enmeshment measures on days 1 and 21 and for the daily diary measures on these days. Simple comparisons were conducted with paired t-tests for each variable. The values of t and its associated P are also shown. The Bonferroni corrected P value ($\alpha = 0.05$) for families of measures are also indicated in the Table legend. In addition we reported effect sizes corrected for the correlation between occasions of measurement (Dunlap et al., 1996).

First, it is noticeable that on the whole patients improved over time as shown by the scores on pain and disability. Second, over the period of 21 days the actual-ideal and actual-feared self-discrepancies were unchanged whereas the magnitude of self-pain enmeshment was significantly reduced. In contrast, the daily diary measures of the discrepancies between

ratings of ideal and actual performance in the 5 domains (physical health, mental health, situation at home and work, and activity level) showed significant changes with ratings of personal achievements showing movement towards the ideal. The greatest changes occurred in the domains of physical health and activity level where the ratings were initially lower than for the other domains. Similarly improvements in daily fear of movement, catastrophizing and negative mood were observed. Positive mood did improve but using the conservative Bonferroni correction criterion this improvement was not statistically significant.

3.5. Multilevel analysis of daily actual-ideal concordance.

We used multilevel modelling to investigate associations between changes in pain, disability, fear of movement and catastrophizing and the change in actual-ideal concordance across the 21 days of observations. We first investigated *same day associations*. The repeated observations (daily diaries) were assigned as level 1 units (within participant) and the individuals (N =42) were level 2 units: a total of 924 observations. The model with the intercept only (model 0) showed that most variance in the outcome variable was due to differences between participants (74%). We then investigated whether the concordance between current and ideal performance increased or decreased over time. The significant positive association between day and actual ideal concordance confirmed our expectation that the concordance score would increase over time (model 1). Second, levels of pain and disability were included in the analyses (model 2). The significant negative association between pain and disability and actual-ideal concordance score indicated that within one day an increase in the concordance score was accompanied with a decrease in pain and disability. Next, pain catastrophizing and fear of movement were entered into the models. This final model, Table 3, showed that neither pain catastrophizing nor fear of movement was a significant predictor for the actual-ideal concordance score on the same day. However, when both variables were entered as single predictors to the model they revealed a significant β

coefficient. Fear of movement accounted for 16% and 2% of the variance between participants and days respectively ($\beta = -0.07$, $P = 0.015$). When pain catastrophizing was entered in the model as a single predictor, the model improved with 17 % of variance between participants and 3 % between days ($\beta = -0.05$, $P = 0.031$).

4. Discussion

We believe that this is the first study to investigate self-discrepancies and self-pain enmeshment in sub-acute pain. As predicted both the actual-ideal and actual-feared discrepancy remained relatively stable over a three-week period but the magnitude of enmeshment decreased significantly. In contrast during this period daily reports of pain level, disability fear of movement, catastrophizing and negative mood declined, and positive mood increased. The present results support the idea that self-pain enmeshment might emerge during the early experience of pain but that in the normal course of recovery it diminishes. This might suggest that although pain has an immediate impact on certain aspects of the self, most people will be able to self-regulate emotions, thoughts and actions in an acute phase. This may be a protective factor countering the development of problems associated with chronic pain. The fact that the measure of enmeshment was correlated with depression and catastrophizing but not with pain, fear of (re)injury or disability lends support to the conceptualization that it is intimately connected with affective processes (Pincus and Morley, 2001) and may provide a clue as to why it may persist in a proportion of patients. However, this hypothesis has not yet been tested due to the absence of prospective studies measuring this construct multiple times including the acute stages of injury.

These results relating discrepancies and mood are broadly in agreement with previous observations on chronic pain patients (Waters et al., 2004; Morley et al., 2005; Sutherland and Morley, 2008; Sutherland and Morley, 2008). Further evidence of the validity of the questionnaires used in this population is to be found in the pattern of expected correlations between the measures of pain, disability, catastrophizing and fear of movement. Although in this study used a checklist method for eliciting self aspects rather than the more usual response production techniques (Morley et al., 2005) there is evidence for the validity of the method. The predicted relationships between actual-ideal discrepancy, enmeshment of the

ideal self and depression have been observed in previous studies (Morley et al. 2005; Sutherland and Morley, 2008) were also observed in this study. In addition the relationship between the actual feared-for self-discrepancy measures of pain and disability reported in other studies (Goossens et al., *in press*); Morley et al. 2005; Sutherland and Morley, 2008) were also observed. Thus participants who perceived themselves as more disabled and in greater pain also experienced their feared self as being closer to their current actual self. The previous studies (Goossens et al. *in press*; Morley et al. 2005; Sutherland and Morley, 2008) have observed significant negative correlations between depression and the actual feared-for self discrepancy, but this observation was not replicated in the current study.

The daily diary measure of the concordance between the actual and ideal performance increased across all 5 domains during the three weeks of observation. It is notable that the largest changes were observed in levels of physical health and activity. One possible explanation for disagreement between the checklist (questionnaire) measure of discrepancies and the diary measure of actual-ideal concordance is in differences in the level of measurement in the two methods. The content of the checklist was primarily concerned with trait-like characteristics whereas the daily diary directed participants to think about their performance in different situations. As there was no explicit attempt to link participants' endorsements in the checklist with behavioural activities the lack of correlation between these two methods is partly explicable. We suggest that one avenue for future exploration of the relationship between the pain and self should more closely examine the relationship between what Carver and Scheier (Carver and Scheier, 1998) have termed principles (what you want to *be*) and procedures (behaviours necessary to sustain the principles – what you *do*). This might also enhance further clarification on the content and distinction of several constructs. We used the term actual-ideal concordance to describe the diary data, but it is possible that we only measured a form of behavioural achievement. This might explain the absence of the

relationship between the diary data and the Self-Questionnaire. In relatively acute pain, pain and disability might only be related to *doing* (the procedural level of goal pursuit) and not *being* (the principal level of goal pursuit). The interesting question therefore is whether changes in doing (behavioural achievement) drive changes in being and enmeshment. However, our data cannot provide the answer to that question. Further studies linking action to self constructs, such as discrepancies and enmeshment, are required.

There are several limitations to this study. First we used a new questionnaire method to measure the self-discrepancies. We tried to develop a questionnaire that was suitable for computing proportion scores and executing statistical analyses but that was less time consuming and less abstract than other measures of self-discrepancies (Hardin and Lakin, 2009) that can place a heavy demand on clinical research participants. Nevertheless several participants had difficulties in filling in the questionnaires: some patients did not endorse enough adjectives or only endorsed enough adjectives in one column. Although further work is needed to refine the usability and establish the validity and reliability of this method of eliciting selves (Higgins et al., 1986) the fact that the predicted relationships were observed is encouraging and lend credence to the method used. Although the self-questionnaire might not be usable in clinical practice in its current form, there are enough workable elements to further investigate the use of this questionnaire. Second, we used a composite measure of enmeshment that incorporated both ideal and feared-for aspects of the self. As a consequence we could not determine the detailed relationship between positive and negative components of enmeshment and its change over time. The relative weighting towards positive (ideal) aspects of the self compared to negative aspects (24 vs 14 descriptors) implies that the measure was more akin to the hoped-for self that has been assessed in earlier studies (Morley et al., 2005; Sutherland and Morley, 2008) and the results are in agreement with earlier observations. A third limitation was the relatively small number of participants and the limited observational

period. It would also have been an advantage to be able to recruit and begin data capture nearer to the onset of neck pain. Additional studies with larger sample sizes are needed to investigate more thoroughly the relationships found in this study.

Overall, the study results show that the effects of acute pain due to a motor vehicle accident extend beyond increased disability and distress levels, and they may affect the integrity of the persons' identity. The study of the self promises to be a valuable addition to our current cognitive-behavioural conceptualization of pain, and deserves further scientific attention.

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Appendix

Descriptors used to elicit actual, ideal and feared for selves

Happy, creative, sensitive, dependable, caring, independent, lonely, cheerful, humorous, frustrated, frightened, efficient, alert, disabled, content, somber, inferior, fit, bitter, insecure, enthusiastic, energetic, pessimistic, nervous, admirable, healthy, assertive, tired, persistent, hardworking, moody, aggressive, worrying, social, confident, friendly, relaxed, optimistic

Table 1 Day one associations between the discrepancy questionnaires and questionnaires on depression, disability, pain, fear of movement, and pain catastrophizing.

	Mean	SD	1	2	3	4	5	6	7
1. A:I Discrepancy	.70	.22							
2. A:F Discrepancy	.83	.17	-.11						
3. Self pain enmeshment	.40	.22	.51 **	.05					
4. CES-D	13.94	9.03	.44 *	.05	.51 **				
5. Pain	4.47	2.60	-.01	-.32	.24	.28			
6. NDI	15.09	8.93	.03	-.43**	.30	.36*	.79**		
7. TSK	36.29	5.68	.16	-.21	.31	.29	.24	.28	
8. PCS	16.67	11.20	.20	-.04	.42*	.57 *	.30	.31	.60**

Notes A:I = Actual-Ideal discrepancy, A:F = Actual-Feared discrepancy, NDI = Neck Disability Index, TSK = Tampa Scale of Kinesiophobia, PCS = Pain Catastrophizing Scale and CES-D = Centre of Epidemiology Studies – Depression, * = significant at .05 level, ** = significant at .01 level. N varies from 36 to 42

Table 2 Change from day 1 to day 21

	DAY 1		DAY21							
	Mean	(SD)	Mean	(SD)	t	P	N	d	95%CI_Lo	95%CI_Hi
Pain and disability										
Pain (average during day) (0-10)	4.81	(1.85)	2.71	(2.19)	6.13	< .001 ^c	31	1.323	0.694	1.952
Disability (0-64)	30.48	(8.53)	22.76	(8.50)	5.76	< .001 ^c	29	0.906	0.455	1.358
Self measures										
Actual Ideal Discrepancy (0-1)	.70	(0.23)	.69	(0.22)	.16	.871 ^a	34	0.027	-0.300	0.353
Actual Feared Discrepancy (0-1)	.86	(0.15)	.88	(0.18)	-.66	.518 ^a	34	-0.138	-0.554	0.276
Self Pain Enmeshment (0-1)	.40	(0.22)	.26	(0.24)	3.60	.001 ^a	42	0.589	0.222	0.957
Concordance measure										

Actual ideal concordance - Total (0-30)	16.04	(5.81)	21.37	(7.56)	-5.11	< .001	30	-0.767	-1.089	-0.365
Physical health (0-5)	2.35	(1.60)	3.94	(1.71)	-5.04	< .001 ^b	31	-0.953	-1.453	-0.453
Mental health (0-5)	3.74	(1.48)	4.55	(1.52)	-2.70	.011 ^b	31	-0.536	-0.969	-0.104
Situation at home (0-5)	3.87	(1.59)	4.61	(1.40)	-2.41	.022 ^b	31	-0.494	-0.931	-0.056
Situation at work (0-5)	3.37	(1.99)	4.33	(1.79)	-3.39	.002 ^b	30	-0.509	-0.855	-0.163
Activity level (0-5)	2.65	(1.54)	4.03	(1.96)	-5.31	< .001 ^b	31	-0.764	-1.154	-0.374
Appraisals and mood										
Fear of Movement (0-6)	2.23	(1.45)	1.19	(1.42)	3.72	.001 ^c	31	0.718	0.263	1.172
Pain Catastrophizing (0-6)	1.41	(1.58)	0.46	(0.79)	3.49	.002 ^c	29	0.725	0.240	1.209
Positive mood (0-24)	12.50	(4.71)	14.60	(5.99)	-2.09	.045 ^c	30	-0.384	-0.769	0.001
Negative mood (0-36)	9.10	(6.87)	5.17	(5.01)	2.66	.013 ^c	29	0.419	0.075	0.764

Notes t = paired t-test value; r = Pearson correlation; N = number of paired observations; d = effect size given by Dunlap et al's. (1996) formula $(t*[2(1-r)/N])^{1/2}$; 95%CI_Lo and 95%CI_Hi = 95% confidence intervals for d . P values are Bonferroni corrected for family-wise tests, k = number of tests: ^a Self-discrepancy and enmeshment measures, $k = 3$, $P = 0.017$; ^b Actual:ideal concordance rating subscales, $k = 5$ $P = .001$; ^c Pain, mood and disability measures, $k = 6$, $P = .008$.

Table 3 Within days associations with day, disability, fear of movement and pain catastrophizing as predictors and Actual-Ideal concordance as dependent variable. SE = Standard error, ns = non significant.

	Model 3			Model 4			Final model		
<u>Actual-Ideal Concordance</u>	-2*log(lh) = 3719.215			-2*log(lh) = 3678.250			-2*log(lh) = 3649.204		
	Estimate	SE	Beta	Estimate	SE	Beta	Estimate	SE	Beta
Intercept	25.282	0.758		25.587	1.012		25.443	0.726	
Day	0.120	0.020	0.097	0.121	0.019	0.098	0.121	0.019	0.098
Pain	-0.324	0.111	-0.106	-0.259	0.098	-0.084	-0.213	0.101	-0.069
Disability	-0.428	0.020	-0.637	-0.416	0.021	-0.619	-0.414	0.021	-0.615
Fear of Movement				-0.155	0.063	-0.065	-0.095	0.067	-0.040 ^{ns}
Pain Catastrophizing							-0.084	0.050	-0.045 ^{ns}

